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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/750,734	12/31/2003	Suresh Ramarajan	MICS:0118 (03-0072)	1848

7590 09/12/2006  
Michael G. Fletcher  
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EXAMINER

CHEN, KIN CHAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 09/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/750,734

Applicant(s)

RAMARAJAN, SURESH

Examiner

Kin-Chan Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 05102004.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. This application contains claims directed to the following patentably distinct species:

- A. hardening of metal layer by oxidizing the metal layer (claims 4, 11, and 19).
- B. hardening of metal layer by coating the metal layer with polymer.

2. Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claim 1 is generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species.

MPEP § 809.02(a).

3. During a telephone conversation with Michael G. Fletcher on September 7, 2006 a provisional election was made without traverse to prosecute the invention of species A, claims 1-9, and 11-23. Affirmation of this election must be made by applicant in replying to this Office action. Claim 10 is withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

***Claim Rejections - 35 USC § 102***

5. Claims 1-4, 6,7, 11-14, 16, and 17 are rejected under 35 U.S.C. 102(a) as being anticipated by Thomas (US 2003/0020141).

In a method for planarization by polishing the wafer having a metal layer, Thomas teaches oxidizing (annealing) the metal layer (so-called hardening a metal in instant claims) prior to chemical mechanical polishing. Chemical mechanical polishing may be performed on the wafer. The oxidizing (annealing) makes the metal layer more resistant to abrasion (chemical attack). See [0033][0034]. The metal may comprise

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copper [0036]. Copper oxide may be formed [0039]. The wafer may have one or more metal contact plugs, see Figures. As to dependent claims 13 and 14, Thomas teaches temperature ranges, see [0039]. Thomas teaches oxidizing with oxygen, see [0039].

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 5, 8, 9, 15, and 18-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas (US 2003/0020141).

In a method for planarization by polishing the wafer having a metal layer, Thomas teaches oxidizing (annealing) the metal layer (so-called hardening a metal in instant claims) prior to chemical mechanical polishing. Chemical mechanical polishing may be performed on the wafer. The oxidizing (annealing) makes the metal layer more resistant to abrasion (chemical attack). See [0033][0034]. The metal may comprise copper [0036]. Copper oxide may be formed [0039]. The wafer may have one or more metal contact plugs, see Figures. Thomas teaches temperature ranges, see [0039]. Thomas teaches oxidizing with oxygen, see [0039].

Dependant claim 5 differs from Thomas by specifying various sizes and dimensions (thickness of an oxide layer). Because same are merely a matter of choices

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of design depending on the product requirements, it would be obvious to one skilled in the art to use various thickness in order to accommodate the specific product design and meet the product requirement.

As to dependent claims 8,9 and 23, Thomas [0003] teaches forming the interconnect by filling the trenches with metal for semiconductor device, making commonly used tungsten obvious. It would have been further obvious to one with ordinary skill in the art that the tungsten oxide is formed on the surface of the metal when oxidizing tungsten.


The above cited claims differ from the prior art by specifying well-known features (such as oxidizing in an annealing process with ozone in claims 18 and 21; depositing metal by plating in claim 19) to the art of semiconductor device fabrication, the examiner takes official notice. A person having ordinary skill in the art would have found it obvious to modify Thomas by adding any of same well-known features to same in order to provide their art recognized advantages and produce an expected result with a reasonable expectation of success.

As to dependent claim 15, since Thomas teaches annealing in the range of 100 to 500 degrees C for a time duration sufficient for annealing wafer to a desired resistivity [0033]. Hence, it would have been obvious to one with ordinary skill in the art to adjust the period of annealing time through the routine experimentation in order to achieve desired resistivity.

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8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

September 8, 2006

  
Kin-Chan Chen  
Primary Examiner  
Art Unit 1765